

CLAIMS

1. An optical switch/variable attenuator comprising:

a polarization separating sub-system;

at least one switchable diffraction grating; and,

a polarization recombining sub-system;

means for varying a diffraction efficiency of said at least one switchable diffraction grating;

said polarization separating sub-system being optically disposed to receive an input optical beam of arbitrary polarization and also being capable of separating the input optical beam into a first optical beam of a first polarization and a second optical beam of a second polarization, said second polarization being distinct from said first polarization, and emitting a first emitted optical beam of the first polarization and a second emitted optical beam of the second polarization, said emitted first and emitted second optical beams constituting an input channel of the first polarization;

said at least one switchable diffraction grating being optically disposed to receive the input channel and capable of providing at least one transmitted channel, the at least one transmitted channel comprising at least one transmitted optical beam of the first polarization and at least one other transmitted optical beam of the second polarization; and,

said polarization recombining sub-system being optically disposed to receive the at least one transmitted optical beam of the first polarization and the at least one other transmitted optical beam of the first polarization and capable of recombining the at least one transmitted optical beam of the first polarization and the at least one other transmitted optical beam of the first polarization into at least one final output beam of combined polarization.

2. The optical switch/variable attenuator of claim 1 further comprising:

a static grating optically disposed between said at least one switchable volume diffraction grating and said polarization recombining sub-system; and, wherein said at least one switchable diffraction grating comprises one switchable volume diffraction grating.

3. The optical switch/variable attenuator of claim 1 further comprising:

at least one control element capable of controlling switching of said at least one switchable diffraction grating.

4. The optical switch/variable attenuator of claim 1 further comprising:

a static grating optically disposed between said polarization separating sub-system and said at least one switchable diffraction grating; and, wherein said at least one switchable diffraction grating comprises one switchable volume diffraction grating.

5. The optical switch/variable attenuator of claim 1 wherein said at least one switchable diffraction grating comprises two switchable volume diffraction gratings;
a first of said two switchable volume diffraction gratings being optically disposed between said polarization separating sub-system and a second of said two switchable volume diffraction gratings; and,
the second of said two switchable volume diffraction gratings being optically disposed between the first of said two switchable volume diffraction gratings and said polarization recombining sub-system.
6. The optical switch/variable attenuator of claim 2 wherein said static grating includes a transparent region.
7. The optical switch/variable attenuator of claim 6 further comprising:
two output beam ports; and,
wherein said at least one final output beam comprises two final output beams;
each one of said two output beam ports being capable of receiving from said polarization recombining sub-system one final output beam from said two final output beams.
8. A method for providing variable attenuation of a beam, the method comprising the steps of:
providing an optical system, said optical system comprising at least one switchable volume diffraction grating;
providing an input beam to said optical system;
enabling the at least one switchable volume diffraction grating to diffract, with a predetermined diffraction efficiency, the input beam into a diffracted beam and a transmitted beam; and,

utilizing the predetermined diffraction efficiency to effect the variable attenuation of the input beam.

9. The method of claim 8 wherein said optical system further comprises a static grating; and, wherein the at least one switchable volume diffraction grating comprises one switchable volume diffraction grating; and, wherein the switchable volume diffraction grating is optically disposed to receive the input beam.
10. The method of claim 8 wherein said optical system further comprises a static grating; and, wherein the at least one switchable volume diffraction grating comprises one switchable volume diffraction grating; and, wherein the static grating is optically disposed to receive the input beam.
11. A method for switching one input optical beam to two output beams, the method comprising the steps of:
providing a switchable volume diffraction grating;
providing a static grating having a transparent region;
enabling said switchable volume diffraction grating to diffract, with a predetermined diffraction efficiency, the input optical beam into a diffracted beam and a transmitted beam;
diffracting, with a predetermined diffraction efficiency, the input beam into a diffracted beam and a transmitted beam;
diffracting the diffracted beam utilizing the static grating; and,
transmitting the transmitted beam through said transparent region;

wherein the diffracted beam and the transmitted beam
comprise the two output beams.